

CLAIMS

What is claimed is:

1. An extendable arm for placing and moving items comprising:
a base;
5 an arm unit movably mounted to the base, the arm unit being configured for linear movement in a first direction relative to the arm unit for extending beyond the base in the first direction and for linear movement in a second direction relative to the arm unit which is opposite to the first direction for extending beyond the base in the second direction.
- 10 2. The arm of Claim 1 in which the arm unit includes more than one movable stage for increased reach and compact retraction in a neutral position.
3. The arm of Claim 2 further comprising a drive mechanism for driving said more than one stage.
4. The arm of Claim 3 in which the drive mechanism is a single drive.
- 15 5. The arm of Claim 3 in which the drive mechanism comprises multiple drives.
6. The arm of Claim 1 in which the items are held by the arm by at least one of the top, bottom and a side of the item.

7. A storage system comprising:
a first storage rack;
a second storage rack spaced apart from the first storage rack; and
a robot positioned between the first and second storage racks for placing
5 and removing items from the racks, the robot including an extendable arm
having an arm unit configured for linear movement in a first direction relative to
the arm unit for placing and removing items from the first rack, and for linear
movement in a second direction relative to the arm unit which is opposite to the
first direction for placing and removing items from the second rack.
- 10 8. The system of Claim 7 in which the items in both racks are positioned to face in
the same direction.
9. A gripper arm assembly comprising:
a gripper arm for placing and moving items that is movably mounted to a
vertical member for vertical movement, the gripper arm being supported by a
15 cable passing over a pulley and balanced by a counter weight; and
a brake coupled to the pulley for braking the pulley and vertical
movement of the gripper arm.
10. A retainer for a FOUP comprising:
a series of protrusions for supporting a bottom of the FOUP, the
20 protrusions having a length extending into recesses within the FOUP; and
a retaining member spaced above the FOUP by a distance less than the
length of the protrusions to prevent disengagement of the protrusions and
recesses by lifting of the FOUP.
11. The retainer of Claim 10 in which the retaining member can be moved to
25 provide access to the FOUP.

12. A method of forming a wafer product comprising:
- storing a manufacturing item in storage rack;
- removing the manufacturing item from the storage rack with an extendable arm, the extendable arm including a base and an arm unit movably
- 5 mounted to the base, the arm unit being configured for linear movement in a first direction relative to the arm unit for extending beyond the base in the first direction and for linear movement in a second direction relative to the arm unit which is opposite to the first direction for extending beyond the base in the second direction, the manufacturing item being in the storage rack in one of the
- 10 first and second directions; and
- conveying the manufacturing item to at least one processing station where process steps are conducted for forming the wafer product.
13. The method of Claim 12 in which the wafer product is a chip and the manufacturing item is a wafer.
- 15 14. The method of Claim 12 in which the manufacturing item is a reticle.